Idaho State Department of Agriculture
Division of Agricultural Resources

Northwest Ada County Ground Water Quality Monitoring Results 2001-2005

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ISDA Technical Results Summary #25 June 2006

Introduction

The Idaho State Department of Agriculture (ISDA) initiated the Eagle Local Project (Figure 1) northwest of the city of Eagle in 2001 in response to previous monitoring in the area that detected agricultural contaminants within the ground water. The objectives of the project are to: (1) characterize ground water quality related to primarily nitrates and pesticides, (2) determine if legal pesticide use has impacted the local aquifer, (3) relate data to agricultural land use practices, and (4) provide data to support voluntary and/or regulatory implementation and evaluation of Best Management Practices (BMP) for ground water protection.

Nutrients, pesticides, and common ions were evaluated during the five years (2001 through 2005) of ISDA's sampling efforts for the Eagle Local Project. Laboratory results have indicated that numerous domestic wells located in the project area have nitrate-nitrogen (NO_3-N) that exceed the Maximum Contaminant Level (MCL) of 10 milligrams per liter (mg/L). Low level concentrations of various pesticides and elevated levels of dacthal (DCPA), 1,2-dichloropropane (1,2-DCP), and 1,2,3-trichloropropane (1,2,3-TCP) were detected in numerous wells.

ISDA is currently working to advise residents and officials of the area to minimize further ground water contamination and possible health risks. Ground water monitoring will continue at least through the year 2006 to assist with these efforts.

Background

In 1991, the Idaho Department of Water Resources (IDWR) Statewide Program detected two volatile organic compounds (VOCs) associated with pesticides, 1,2-DCP and 1,2,3-TCP, in the ground water northwest of Eagle (Howarth, 1999; Bahr et al., 2000). The Idaho Department of Environmental Quality (IDEQ) sampled a well near the IDWR Statewide well in 1991 and detected

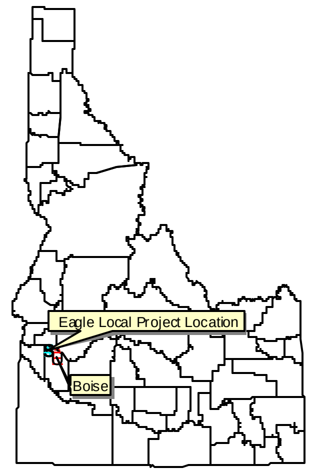

Figure 1. Location of Eagle local project.

1,2,3-TCP (Howarth, 1999).

In response to the VOC detections, ISDA tested eight domestic wells in a one-mile radius of the original VOC detections in December 1991 and February 1992. Ten additional wells were sampled in June 1992 by ISDA. Six wells had 1,2-DCP detections, with a maximum concentration of 7 micrograms per liter (µg/L). Five wells had 1,2,3-TCP detections, with the maximum concentration of 29 µg/L.

Twenty domestic wells were tested by ISDA for nitrate and pesticides in the spring of 1995. A follow up of 15 additional wells plus one well from the original 20 were tested in the fall of 1995 by ISDA. A variety of pesticides and VOCs were found in some of the wells, including dacthal, atrazine, 1,2-DCP, and 1,2,3-TCP.

In 1997, IDEQ and ISDA conducted follow-up monitoring of four domestic wells in the area northwest of Eagle for pesticides. All four wells contained 1,2,3-TCP and dacthal and one well also contained the herbicide atrazine (Howarth, 1999).

Methods

To establish this project, ISDA selected domestic wells up, down, and side gradient to wells that had elevated NO_3-N and pesticide detections in previous sampling events. All sampling was conducted after a quality assurance project plan (QAPP) was established. Permission was gained from the land owners prior to sampling.

Nutrients and other common ions were evaluated every year since 2001. All sample collections followed established ISDA protocols (on file at ISDA main office) for handling, storage, and shipping. Samples were sent to the University of Idaho Analytical Sciences Laboratory (UIASL) in Moscow, Idaho. UIASL conducted tests for nitrate, nitrite, ammonia, orthophosphorous, chloride, sulfate, bromide, and fluoride using EPA Methods 300.0 and 350.1. Duplicates, splits, and matrix spikes/matrix spike duplicates were collected and submitted as a part of the QAPP.

In 2001, samples were collected from selected wells following ISDA protocols for nitrogen and oxygen isotope analysis. Samples were frozen and shipped via Federal Express one-day service to North Carolina State University Stable Isotope Laboratory in Raleigh, North Carolina. In 2003 through 2005, samples were collected from selected wells for nitrogen isotope analysis. The samples were frozen and shipped via Federal Express one-day service to the Idaho Stable Isotopes Laboratory at the University of Idaho in Moscow, Idaho.

In 2001, samples from all wells were sent to UIASL for pesticide analysis. UIASL used gas chromatography scans for pesticides utilizing EPA Method 515.1 and volatile organic compounds (VOC) utilizing EPA Method 502.2. In 2002, five samples were sent to the Idaho State Laboratory for Method 524.2 VOC analysis. In 2003 and 2004, two samples were sent to the Idaho State Laboratory for Method 524.2 VOC analysis. Duplicates, splits, and matrix spikes/matrix spike duplicates were collected and submitted as a part of the QAPP.

Description of Project Area

Land Use

The major crops in the area include turf, field corn, corn silage, mint, wheat, sugar beets, alfalfa, barley, and potatoes. Gravity and sprinkler irrigation systems are used in the project area. A cattle feedlot with the capacity for 17,000 animals is located in the south-central portion of the project area. In addition, the Eagle Sewer District previously operated a rapid infiltration wastewater treatment system on approximately 40 acres located in the southern portion of the project area.

Geology and Hydrogeology

Ground water used for domestic purposes in the project area appears to come from two sources: (1) a shallow system of clayey sand, sand, and gravel, and (2) a deeper confined system of clay and sand. The two aquifers are separated by a thick clay layer. Thomas and Dion (1974) suggest that the deeper confined aquifer is part of the Glenns Ferry Formation of the Idaho Group and the upper system is composed of older terrace gravels, younger terrace gravels, and recent finer grained alluvial deposits. The shallow subsurface alluvial deposits are conducive to leaching of contaminants. Potential sources for nitrate leaching to the ground water in the area include applied nitrogen-based fertilizers, septic systems, cattle manure, legume crops, and wastewater lagoons. Potential sources of recharge to this shallow system are applied irrigation waters, canal leakage, and precipitation. Ground water flow of the upper aquifer is to the southwest towards the Boise River (Thomas and Dion, 1974; Parliman, 1998; Howarth, 1999).

The major soil association in the project area is the Feltham Series (Collett, 1980). The soils in the study area is composed mainly of Feltham loamy fine sand. The soil is very deep and rapidly drained. Permeability in the upper profile is rapid and is moderately rapid in the lower profile. Runoff is slow and the hazard of erosion is slight. Well drained sandy soils generally increase the vulnerability of aquifer contamination from nutrients leaching into the ground water.

Results

Sampling results of the first five years indicate NO_3-N and pesticide impacts have occurred to the aquifer. Results are summarized and presented in the following sections.

Nitrate

Table 1 presents statistics for 17 wells that have been sampled consistently for nitrate for five years (2001 to 2005). Approximately 19 wells have been sampled each year; however, only the 17 wells that have been consistently sampled every year are used for the statistical analysis in Table 1.

Results of ground water sampling in the project area

Table 1. Nitrate-nitrogen results for Eagle local project, 2001-2005.[1]

Concentration Range (mg/L)	2001 (17 Wells)	2002 (17 Wells)	2003 (17 Wells)	2004 (17 Wells)	2005 (17 Wells)
<LDL[2] (0.05)	0	0	0	0	0
LDL to <2.0	4	6	4	3	5
2.0 to <5.0	5	3	4	7	3
5.0 to <10.0	1	3	3	2	2
>10.0	7	5	6	5	7
Mean Value (mg/L)	11	13	11	12	13
Median Value (mg/L)	3.4	5.6	3.9	3.5	5.1
Maximum Value (mg/L)	38	48	39	44	48

[1]Table 1 statistics are for the same 17 wells sampled each year. ISDA sampled more than 17 wells per sampling year, however, only wells that were consistently sampled were used for the statistics.
[2]LDL - Laboratory Detection Limit, which is 0.05 mg/L.

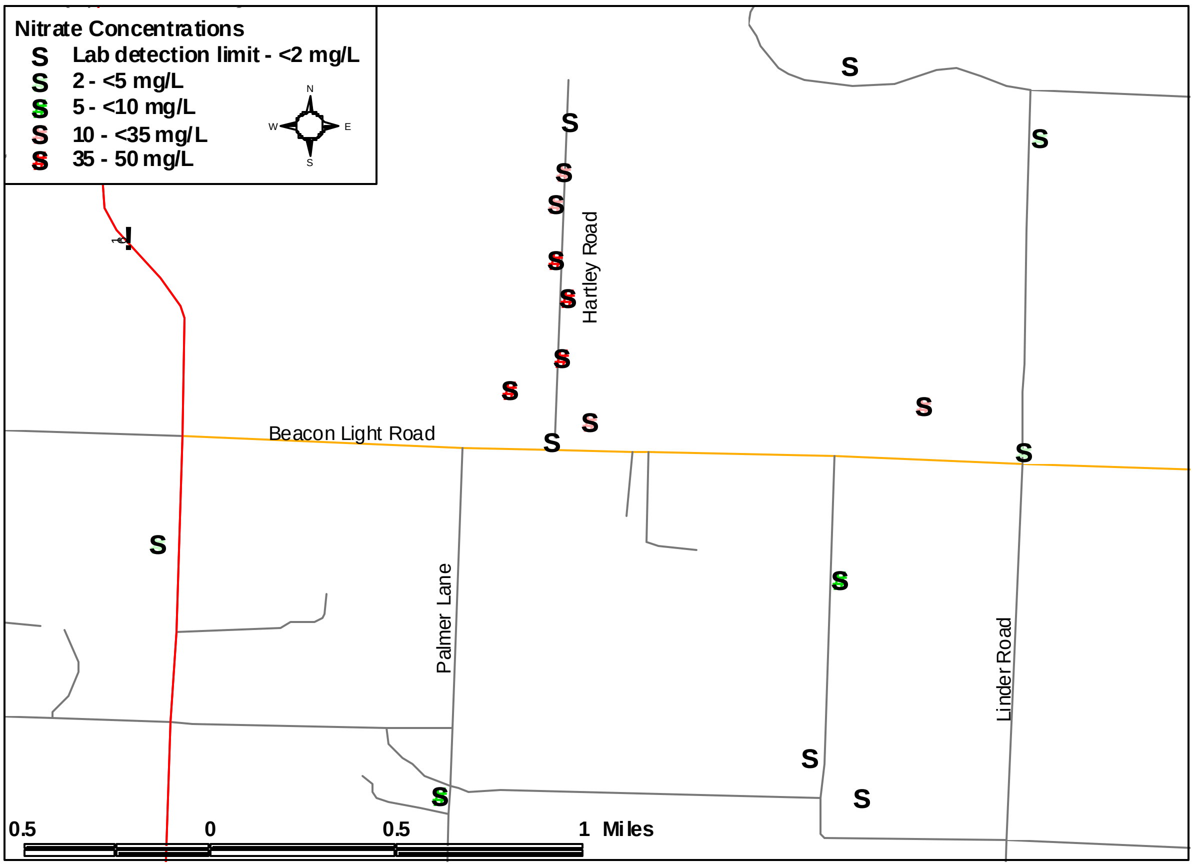

Figure 2. Locations of wells sampled by ISDA in the Eagle local project, 2005. Colors represent nitrate-nitrogen concentration range measured in ground water from each well.

indicate a fairly consistent mean NO_3-N concentration during the five years of sampling, fluctuating from 11 mg/L to 13 mg/L (Table 1). The maximum concentration during 2005 was 48 mg/L. Seven wells, or 41%, had NO_3-N concentrations over the MCL health standard of 10 mg/L. The median NO_3-N concentration in 2005 was 5.1 mg/L (Table 1).

Eighteen wells were sampled in 2005 for NO_3-N (Figure 2). Nitrate-nitrogen concentrations are most elevated in the area along Hartley Road (Figure 2). The number of detections over 10 mg/L is of concern because of potential health risks.

Pesticides and Volatile Organic Compounds

Twenty-one wells were sampled for pesticides and VOCs in 2001. Analysis of samples detected the presence of the pesticide dacthal (DCPA) (Table 2). The VOCs 1,2,3-TCP and 1,2-DCP were also detected in some samples (Table 2). The locations of the pesticide and VOC detections are shown on Figure 3. The two VOCs

Table 2. Pesticide and volatile organic compound results for Eagle local project, 2001.*

Chemical Name	Trade Name	Number of Detects	Range (µg/L)	Mean Value (µg/L)	Health Standard (µg/L)
1,2,3-Trichloropropane[1]	Telone, Verlex, D-D	9	0.7 - 5.5	3.0	40 (HAL)[2]
1,2-Dichloropropane	Vidden D[3]	1	1	-----	5 (MCL)[4]
Chloroethane	-----[5]	14	1 - 17	4.5	-----[6]
Dacthal	Dacthal	13	0.14 - 30	11.9	70 (HAL)

*Note: 21 wells were tested for pesticides and VOCs in 2001.
[1]1,2,3-Trichloropropane (1,2,3-TCP) is a chemical intermediate in the production of several chemicals, including 1,2-Dichloropropane (1,2-DCP). There are other non-agricultural products with 1,2,3-TCP as a chemical intermediate.
[2]HAL—EPA Health Advisory Level
[3]Vidden D is a discontinued trade name.
[4]MCL—EPA Maximum Contaminate Level
[5]Chloroethane is not associate with pesticides.
[6]Chloroethane does not have a drinking water health standard.

Table 3. Pesticide and volatile organic compound results for Eagle local project, 2002.*

Chemical Name	Trade Name	Number of Detects	Range (µg/L)	Mean Value (µg/L)	Health Standard (µg/L)
1,2,3-Trichloropropane[1]	Telone, Verlex, D-D	2	5.8 - 9	7.4	40 (HAL)[2]
1,2-Dichloropropane	Vidden D[3]	1	0.9	0.9	5 (MCL)[4]
Dacthal (DCPA)	Dacthal	5	3 - 10	6.48	70 (HAL)

*Note: 5 wells were tested for pesticides and 2 wells were tested for VOCs in 2002.
[1]1,2,3-Trichloropropane (1,2,3-TCP) is a chemical intermediate in the production of several chemicals, including 1,2-Dichloropropane (1,2-DCP). There are other non-agricultural products with 1,2,3-TCP as a chemical intermediate.
[2]HAL—EPA Health Advisory Level
[3]Vidden D is a discontinued trade name.

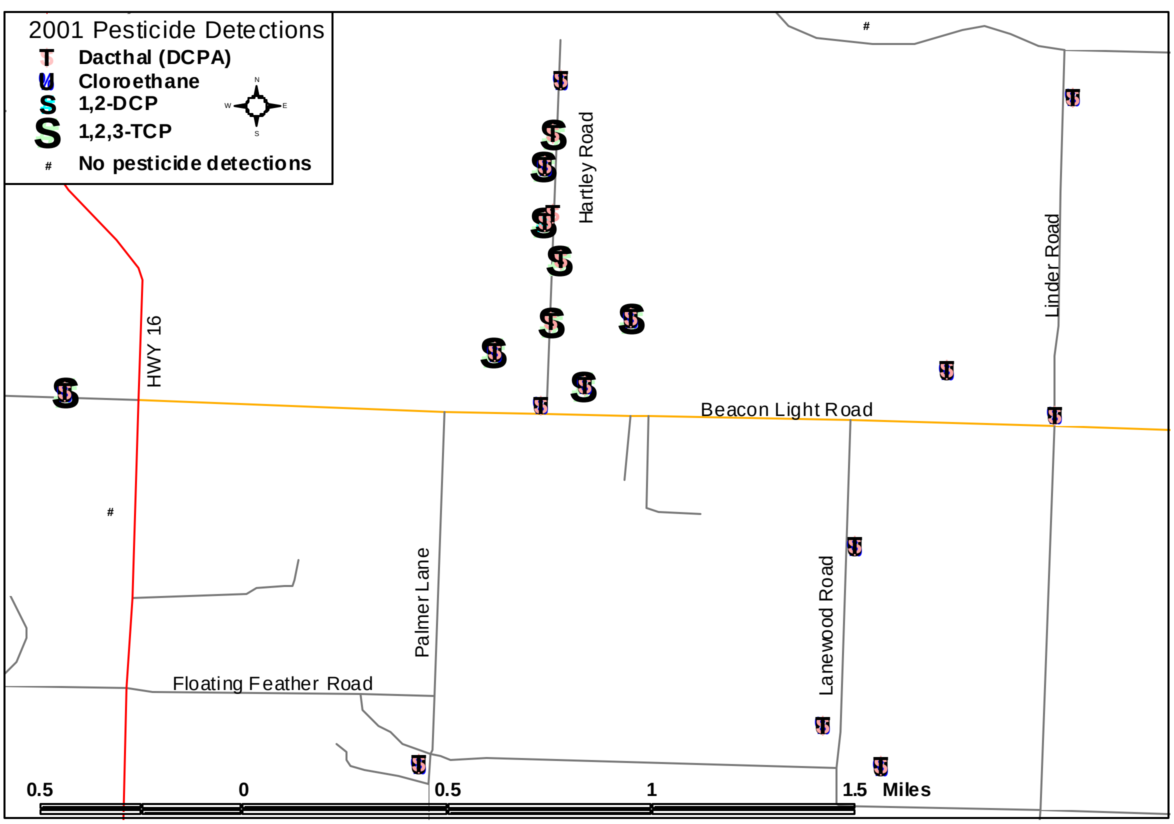

Figure 3. Pesticide detections for the Eagle local project in 2001.

are believed to have been contained in insecticidal fumigants as either an active ingredient, inert, or an impurity (Whitney et al., 1992). The VOCs 1,2,3-TCP and 1,2-DCP are no longer part of current pesticide formulations due to EPA registration process. In addition, the chemical chloroethane was detected in 14 wells. Chloroethane is used in the production of cellulose, dyes, medial drugs, and other commercial products such as solvents and refrigerants (ATSDR, 1999). EPA has not established a health standard in drinking water for chloroethane; safe exposure concentrations are only available for air. There is no record of chloroethane being used in a pesticide, so it is thought that the source of the detections is not agricultural. All compounds detected in 2001 had concentrations less than EPA health standards.

Five wells were sampled for pesticides and two wells were sampled for VOCs in 2002. The wells were chosen for pesticide or VOC analysis because each had elevated 1,2-DCP, 1,2,3-TCP, and/or dacthal (DCPA) concentrations during the 2001 sampling. The five wells tested for pesticides all had dacthal (DCPA) detections, ranging in concentration from 3 to 10 µg/L (Table 3). The two wells analyzed for VOCs had 1,2,3-TCP detections, and one well had a 1,2,-DCP detection (Table 3). All pesticide and VOC concentrations were below EPA health standards.

In 2003 and 2004, the same two wells that were sampled for VOCs in 2002 were again sampled for VOC analysis because each had elevated 1,2-DCP and/or 1,2,3-TCP concentrations.

In 2003, both wells had 1,2,3-TCP detections ranging from 5.8 to 8.7 µg/L, and one well had a 1,2,-DCP detection at 0.5 µg/L (Table 4). All pesticides detected had concentrations less than health standards set by the EPA.

In 2004, both wells had 1,2,3-TCP detections ranging from 3.2 to 6.6 µg/L, and one well had a 1,2,-DCP detection at 0.7 µg/L (Table 4). All pesticides detected had concentrations less than health standards set by the EPA.

In 2005, both wells were tested again for VOCs. One additional well was tested for pesticides. Two wells had 1,2,3-TCP detections ranging from 3.1 to 6.8 µg/L, one well had a 1,2-DCP detection at 0.55 µg/L, and one well had a dacthal (DCPA) detection at 3.65 µg/L (Table 5). All VOCs and pesticides detected had concentrations less than health standards set by the EPA.

Nitrogen and Oxygen Isotopes

Overview

The ratio of the common nitrogen isotope ^{14}N to its less abundant counterpart ^{15}N relative to a known standard

Table 4. Volatile organic compound results for Eagle local project, 2003 and 2004.*

Chemical Name	Trade Name	2003 Data: Number of Detects	2003 Data: Range (µg/L)	2003 Data: Mean Value (µg/L)	2004 Data: Number of Detects	2004 Data: Range (µg/L)	2004 Data: Mean Value (µg/L)	Health Standard (µg/L)
1,2,3-Trichloropropane[1]	Telone, Verlex, D-D	2	5.8 - 8.7	7.25	2	3.2 - 6.6	4.9	40 (HAL)[2]
1,2-Dichloropropane	Vidden D[3]	1	0.5	0.5	1	0.7	0.7	5 (MCL)[4]

*Note: 2 wells were tested for VOCs in 2003 and 2004.
[1]1,2,3-Trichloropropane (1,2,3-TCP) is a chemical intermediate in the production of several chemicals, including 1,2-Dichloropropane (1,2-DCP). There are other non-agricultural products with 1,2,3-TCP as a chemical intermediate.
[2]HAL—EPA Health Advisory Level
[3]Vidden D is a discontinued trade name.
[4]MCL—EPA Maximum Contaminate Level

Table 5. Pesticide and volatile organic compound results for Eagle local project, 2005.*

Chemical Name	Trade Name	Number of Detects	Range (µg/L)	Mean Value (µg/L)	Health Standard (µg/L)
1,2,3-Trichloropropane[1]	Telone, Verlex, D-D	2	3.1 - 6.8	5.0	40 (HAL)[2]
1,2-Dichloropropane	Vidden D[3]	1	0.55	-----	5 (MCL)[4]
Dacthal (DCPA)	Dacthal	1	3.65	-----	70 (HAL)

*Note: 2 wells were tested for VOCs and 1 well was tested for pesticides in 2005 .
[1]1,2,3-Trichloropropane (1,2,3-TCP) is a chemical intermediate in the production of several chemicals, including 1,2-Dichloropropane (1,2-DCP). There are other non-agricultural products with 1,2,3-TCP as a chemical intermediate.
[2]HAL—EPA Health Advisory Level
[3]Vidden D is a discontinued trade name.
[4]MCL—EPA Maximum Contaminate Level

(denoted $d^{15}N$) can be useful in determining sources of NO_3-N. Common sources of NO_3-N in ground water are applied commercial fertilizers, animal or human waste, precipitation, and organic nitrogen within the soil. Each of these NO_3-N source categories has a potentially distinguishable nitrogen isotopic signature. Typical $d^{15}N$ ranges for fertilizer is –5 per mil ($^0/_{00}$) to +5 per mil ($^0/_{00}$), while typical waste sources have ranges greater than $10^0/_{00}$ (Kendall and McDonnell, 1998). Nitrogen isotope values between $5^0/_{00}$ and $10^0/_{00}$ are generally believed to indicate an organic or mixed source (Kendall and McDonnell, 1998).

Use of nitrogen isotopes as the sole means to determine NO_3-N sources should be done with great care. Nitrogen isotope values in ground water can be complicated by several reactions (e.g., ammonia volatilization, nitrification, denitrification, plant uptake, etc.) that can modify the $d^{15}N$ values (Kendall and McDonnell, 1998). Furthermore, mixing of sources along shallow flowpaths makes determination of sources and extent of denitrification very difficult (Kendall and McDonnell, 1998).

^{18}Oxygen (^{18}O) fractionization of the nitrate molecule together with $d^{15}N$ can be used to trace the effects of denitrification (Clark and Fritz, 1997). Denitrification results in enrichment of both $d^{15}N$ and $d^{18}O_{NO3}$. By analyzing both $d^{15}N$ and $d_{18}O_{NO3}$, denitrification effects can be distinguished from mixing sources since the ratio of enrichment in $d^{15}N$ to $d^{18}O_{NO3}$ is about 2:1 (Kendall et. al, 1995).

Findings

In 2001, and 2003 through 2005, ISDA conducted $d^{15}N$ testing as a possible indicator of source(s) of NO_3-N in the ground water. Eleven wells were tested in 2001, seven wells were tested in 2003, nine wells were tested in 2004, and eight wells were tested in 2005 (Table 6). Wells chosen for $d^{15}N$ testing had elevated NO_3-N concentrations in previous monitoring rounds. Table 6 shows the $d^{15}N$ results along with NO_3-N concentrations.

Eleven water samples collected in 2001 were sent to the North Carolina State University Stable Isotope Laboratory for $d^{15}N$ and $d_{18}O_{NO3}$ analysis. Results of $d^{15}N$ testing returned values that ranged from $3.60^0/_{00}$ to $14.80^0/_{00}$ (Table 6). Five wells had values that suggested an animal or human waste source; all were located along Hartley Road. Four wells had values that suggested a fertilizer source of NO_3-N; two were located along Hartley Road. The remaining two wells tested had $d^{15}N$ values that indicated an organic or mixed source of nitrates.

Results of the 2001 $d^{18}O$ analysis returned values that ranged from $0.0202^0/_{00}$ to $18.27^0/_{00}$. Evaluations for $d^{18}O_{NO3}$ testing results for 2001 suggest no effects of denitrification. The $d^{15}N$ and $d^{18}O$ data do not indicate isotope enrichment due to the denitrification process. Waste from animal operations and septic tanks in the project area could be a source of $d^{15}N$ values greater than $10^0/_{00}$ detected within the wells.

The seven water samples collected in 2003 were sent to the Idaho Stable Isotopes Laboratory at the University of

Table 6. 2001, and 2002 through 2005 $d^{15}N$ results for selected wells.

	2001 data		2003 data		2004 data		2005 data	
Well ID	$d^{15}N$ ($^0/_{00}$)	NO_3-N (mg/L)	$d^{15}N$ ($^0/_{00}$)	NO_3-N (mg/L)	$d^{15}N$ ($^0/_{00}$)	NO_3-N (mg/L)	$d^{15}N$ ($^0/_{00}$)	NO_3-N (mg/L)
5300601	3.60	16	NS	NS	NS	NS	NS	NS
5301101	NS[1]	2.1	NS	7.3	6.06	4.9	NS	5.1
5302001	4.35	6.2	NS	7.3	5.98	10	4.86	13
5302401	5.44	11	6.23	5.6	6.26	8.2	4.59	19
5302501	4.70	13	6.19	11	6.62	16	5.65	17
5302701	11.23	38	9.33	42	8.59	38	7.29	38
5303001	NS	1.2	NS	1.3	5.48	1.3	NS	1.3
5303301	13.75	17	8.02	21	8.81	21	6.58	20
5303401	11.98	42	NS	NS	NS	NS	7.30	42
5303501	14.33	26	NS	NS	NS	NS	NS	NS
5303701	3.80	38	9.16	46	8.33	38	5.26	37
7600301	6.50	12	21.83	12	NS	NS	NS	9
7600601	14.80	34	8.76	48	8.35	44	6.87	48

$d^{15}N$ <5 $^0/_{00}$ potential NO_3-N source: fertilizer

$d^{15}N$ 5 $^0/_{00}$ to 10 $^0/_{00}$ potential NO_3-N source: mixed/organic

$d^{15}N$ >10 $^0/_{00}$ potential NO_3-N source: waste

[1]NS - Not sampled

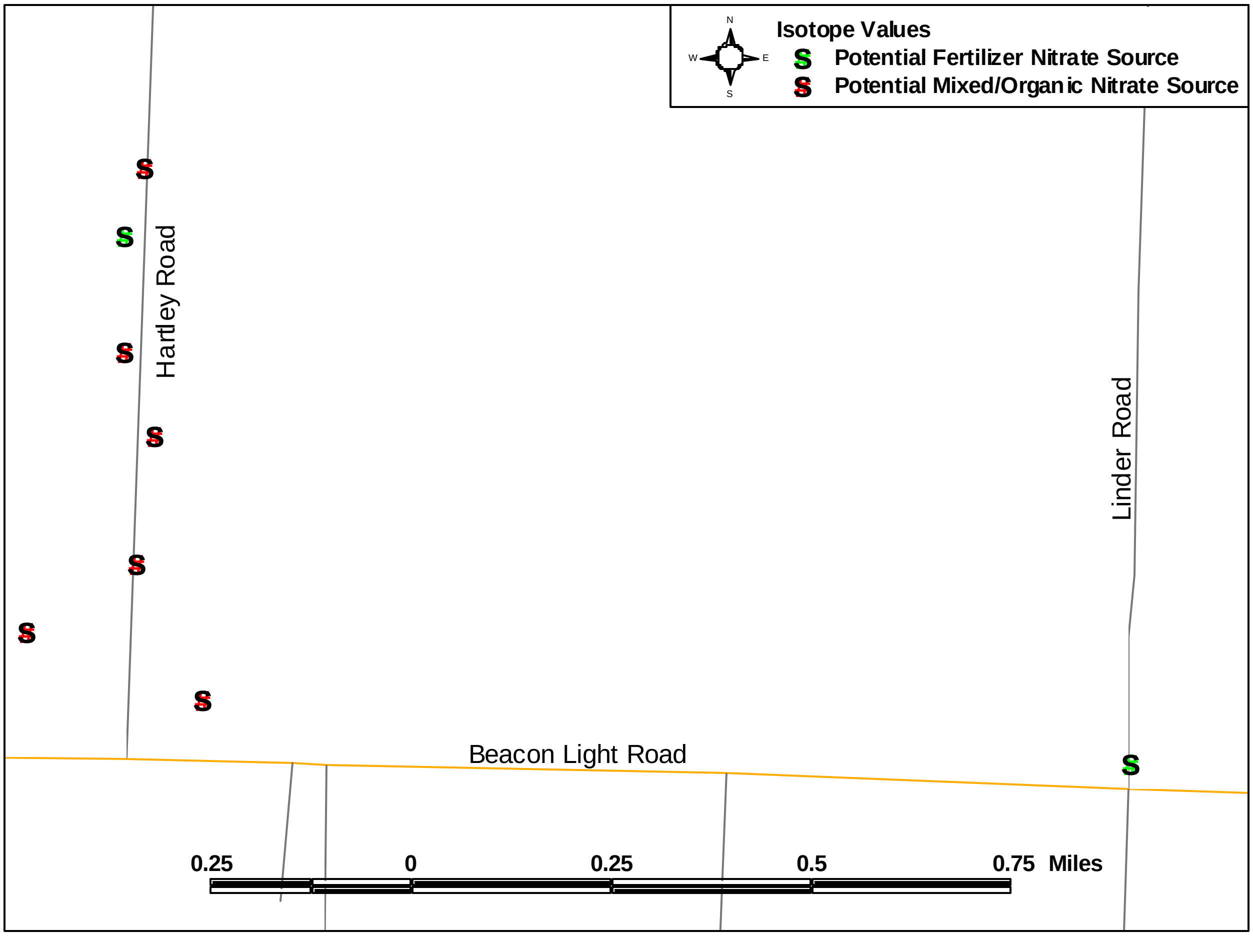

Figure 3. Locations of wells sampled by ISDA in Eagle local project for nitrogen isotope, 2005.

Idaho for d^{15}N analysis. Results of the d^{15}N testing returned values that ranged from $6.19^{0}/_{00}$ to $21.83^{0}/_{00}$ (Table 6). One well had a value that suggested a waste source for NO_3-N. The remaining wells had d^{15}N values that indicated an organic or mixed source of NO_3-N.

Nine water samples collected in 2004 were sent to the Idaho Stable Isotopes Laboratory at the University of Idaho for d^{15}N analysis. Results of the d^{15}N testing returned values that ranged from $5.48^{0}/_{00}$ to $8.81^{0}/_{00}$ (Table 6). All nine wells had d^{15}N values that indicated an organic or mixed source of NO_3-N.

Eight water samples collected in 2005 were sent to the University of North Carolina State Laboratory for d^{15}N analysis. Results of the d^{15}N testing returned values that ranged from $4.59^{0}/_{00}$ to $7.30^{0}/_{00}$ (Table 6). Two wells had d^{15}N values that suggested a fertilizer source of NO_3-N (Figure 3). The remaining six wells had d^{15}N values that indicated an organic or mixed source of NO_3-N. The testing results indicate influences from fertilizer and organic or mixed sources. This area has numerous agricultural fields that both commercial fertilizer and waste from nearby feedlots are applied on, which could be a contributor to the elevated NO_3-N concentrations in the project area.

Conclusions

Ground water within the shallow alluvial aquifer of the project area is being impacted from NO_3-N and pesticides. The number of wells with NO_3-N concentrations over the EPA MCL of 10 mg/L is of concern. Pesticide detections and VOCs were generally low in concentration; however, there is concern about multiple pesticide detections per well and potentially detrimental health effects.

The mean NO_3-N concentration during the five years of sampling fluctuated between 11 mg/L to 13 mg/L. In 2005, 7 wells (or 41%) had NO_3-N concentrations over the EPA MCL of 10 mg/L. The area that had the highest NO_3-N concentrations was located along Hartley Road.

The VOC 1,2-DCP has been detected in one well since 2001. The VOC has been declining in concentration from 1 µg/L in 2001 to 0.55 µg/L in 2005. The VOC

1,2,3-TCP was detected in nine wells in 2001. Follow up sampling occurred from 2002 to 2005 in two wells that had the highest concentrations in the 2001 sampling. The mean concentration of 1,2,3-TCP in the two wells has declined from values greater than 7 µg/L in 2002 and 2003 to values equal to or less than 5 µg/L in 2004 and 2005. The herbicide dacthal (DCPA) was detected in 13 wells (or 62% of the wells tested) during the 2001 sampling. In 2002, five wells were tested for dacthal (DCPA), and all five had positive detections of dacthal (DCPA) in the ground water. All pesticide and VOC detections have been less than EPA health standards. ISDA is planning to sample all wells in the Eagle Local Project for VOCs and pesticides in August 2006.

Agricultural practices likely contribute to the majority of NO_3-N and pesticide detections in the ground water of this project area such as fertilizer and pesticide applications to crop fields. Animal wastes from feedlots and manure application to crop fields are also potential contributors of NO_3-N to the ground water. Testing results indicate NO_3-N and pesticide impacts to the ground water of the project area are widespread. The 2005 $d^{15}N$ values for two wells suggest a fertilizer source of NO_3-N in the ground water. In 2001 $d^{15}N$ values suggested a waste source of NO_3-N in five wells. Leaching of applied commercial fertilizers and manure applications are potential causes of NO_3-N entering the ground water. Well drained sandy soils that are common in the project area increase the vulnerability of the aquifer to contamination from nutrients leaching into the ground water. Oxygen isotope analysis suggested a process other than denitrification for NO_3-N enrichment of $d^{15}N$ values.

Recommendations

ISDA recommends a variety of actions to be taken by landowners, producers, agencies and local governments to mitigate and prevent further contamination of the aquifer in the project area. Also, citizens living in the area and agencies should take measures associated with wells, well drilling, and drinking water management to prevent adverse health affects.

Agricultural, Agrichemical, and Animal Waste Management

ISDA recommends that measures to reduce nitrate and pesticide impacts on ground water be addressed and implemented. The ISDA recommends that:

- Producers and agrichemical professionals conduct nutrient, pesticide, and irrigation water management evaluations, especially north of Beacon Light Road where sandy soil conditions are present.
- Producers follow the Idaho Agricultural Pollution Abatement Plan.
- Producers follow the Natural Resources Conservation Service (NRCS) Nutrient Management Standard (590) when using commercial fertilizers and/or animal waste. Manure should be applied to crop uptake only.
- Producers follow the NRCS Irrigation Water Management Standard (449).
- Livestock producers should evaluate waste management practices.
- Producers, noncrop applicators, and agrichemical dealers evaluate pesticide storage, containment, mixing, loading, rinsing, disposal, and application practices in the project area.
- Pesticide applicators follow the NRCS Pest Management Standard (595).
- Pesticide products that are least likely to leach be chosen for the soil type in this project area.
- Pesticide applicators utilize ISDA Container Recycling Operation (CROP) and the Pesticide Disposal Program (PDP). Information regarding these programs can be found on the ISDA's website: http://www.idahoag.us.
- Producers consider utilizing Integrated Pest Management (IPM) techniques in this area.
- Applicators and homeowners assess lawn and garden practices, especially near wellheads.
- Local residents assess animal and animal waste management situations near wellheads.
- Homeowners manage private septic systems properly.
- Applicators assess current pesticide application practices to non-crop areas (examples: roadsides, canal banks, driveways, etc.).
- Home and garden retail stores establish outreach programs to illustrate proper application and management of nutrients and pesticides.

Monitoring

To determine if current agricultural and pesticide application practices are contributing to ground water degradation and to locate other potential contaminant sources, the ISDA recommends continued and more intensive monitoring in the project area.

Monitoring efforts could include, but not be limited to:

- The continuation of ground water monitoring from domestic wells to track changes over time related to nutrients, common ions, and pesticides.
- Soil sampling and soil pore water sampling for nutrient and pesticide testing associated with nutrient

and pesticide management planning.
- Soil sampling utilizing the NRCS 590 Standard.

Well Testing, Construction, and Management

Domestic drinking water wells within the project area should be protected to provide the best possible drinking water. The ISDA suggests the following options:

- Residents sample their own wells for nitrate on a regular basis.
- Activities near wellheads be done in a manner not to impact well water quality.
- Homeowners consider using the Idaho Home*A*Syst program to conduct self assessments related to wellhead protection. The program is found at http://homeasyst.idahoag.us.
- Construction of new wells or deepening of existing wells in the area be completed with the appropriate planning and design considerations to provide potable water.
- IDWR consider establishing a *well drilling area of concern* for this area.

Ground Water Protection and BMP Response Effort

The ISDA recommends that the Ada Soil and Water Conservation District lead a coordinated local response process to create a plan of action to address these ground water contamination issues. The soil and water conservation district should work with local land owners, agrichemical professionals, CAFO operators, Ada County, the City of Eagle, and agencies to implement this process and seek funding to support the implementation of these and other recommendations. The ISDA will support these local partners in seeking funding and implementing a comprehensive program.

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